Standards-Based Meteorological Activities for All Students

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Canarsie High School is typical urban high school in Brooklyn, New York. We have been involved in a District Initiative in collaboration with the City College of New York (CCNY) to initiate and incorporate relevant technologies into the science content areas and classrooms. Through changes in teaching strategies consistent with science education reform movements for mainstream, gifted and special education students; we have been able to effectively motivate student interest and to enhance and enrich the learning potential of all students. Our lessons involve extensive computer and Internet applications, concentrating our efforts in developing high-ordered reasoning skills to address the required concepts covered in Earth Science and Environmental Science curricula. This is a crucial aspect of applied learning approaches as related science concepts are integrated and clearly demonstrated in our daily lives.

Our task was to infuse *'live'* weather data into Earth Science and Environmental Science classrooms. Student-centered learning activities, laboratory experiences and long-term investigations were designed, written and included into classroom lessons and laboratory sections. This component is aligned with the *New Learning and Performance Standards*, and makes use of investigative and inquiry-based studies through technological resources. These were accomplished through data readings taken from our school weather station and various World Wide Web sites. Weather data from area *>cluster'* schools were also used to compare micro-climates within our local region. This fostered peer communication skills among students and staff throughout the Brooklyn High School District.

Our presentation session allowed us to share and disseminate these ideas and strategies described above, that have made for successful science courses in a typical New York City high school addressing mainstream, gifted and special education students. The following items were discussed and imparted at this presentation:

- ☞ described specific classroom and laboratory activities using weather station data and Internet resources
- ☞ demonstrated particular *>minds-on'* strategies in adapting curricula to meet the needs of at-risk populations
- ☞ characterized collaborative efforts by high schools and colleges to enrich the learning experience for both students and teachers
- ☞ exhibited the *Canarsie High School home page* and specific linkage sites that are used in the Earth Science and Environmental Science classrooms

WEATHER DATA ANALYSIS ACTIVITY SHEET

Date of Analysis _____

Examine the weather data (*tables and graphs*) downloaded from the Canarsie High School Weather Station.

1) For each of the variables indicated, describe any noticeable pattern that exists during the 24-hour period.

- ☞ outside temperature: _____
  _____
- ☞ barometric pressure: _____
  _____
- ☞ humidity: _____
  _____
- ☞ rain fall: _____
  _____
- ☞ wind speed: _____
  _____
- ☞ wind direction: _____
  _____

2) During this 24-hour period, describe the relationship of each weather variable as the barometric pressure falls (or rises).
_____
_____
_____
_____
_____
_____

3) Specify the approximate time when the barometric pressure has reached its minimum (or maximum).
Time of day (am or pm): _____

4) Identify the Outside Temperature, Outside Humidity and Dewpoint values at this time.
Outside Temperature: _____
Outside Humidity: _____
Dewpoint: _____

5) From the information you have examined and listed, describe the weather conditions that existed for the time interval outlined in #3 and #4, above.

_____
_____
_____
_____

6) Explain how changes in barometric pressure relate to the potential of precipitation?

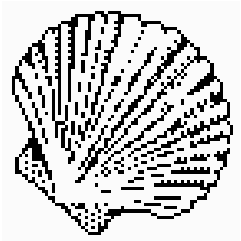
_____
_____
_____
_____

7) State how your data reflects these inter-dependent weather concepts.

_____
_____
_____
_____
_____
_____
_____

C.O.N.E.Y. PROJECT

INTRODUCTION:



The **C.O.N.E.Y.** (**C**ombined **O**ceanic and **N**autical **E**nvironmental Effect on **Y**ou) Project is an observational project that encourages students to analyze and explain the effect of the ocean on the New York City vicinity. This project is a Brooklyn High School local project that will be used as a Regents Earth Science (Program Modification) long-term investigation.

This project will include:

- ☞ *collection of weather data (archived and current)*
- ☞ *analysis of weather data*
- ☞ *field trips to Prospect Park and Jamaica Bay*
- ☞ *observations of various ecosystems*
- ☞ *creation of a technique to predict the ocean-land interaction*

New York City's proximity to the ocean allows us to witness the dynamic interaction of the ocean and land areas. This interaction has a pronounced effect on the local climate of the five boroughs and is an important factor in forecasting the weather for the New York City area.

We will use National Weather Service stations across the New York City area and local school-based weather stations. These networks of weather data recording sites allow us to observe, analyze and understand the complex ocean-land climate interaction. The collection of real time data, and the analysis of that data invites students to examine the local climate in a way which enhances concept understanding of climate and weather patterns.

This project relies heavily on the use of Internet resources to collect our data, examine and analyze images of the New York City area, and to *"connect"* local schools in this active learning process. This combination of data, images and collaboration provides our students the opportunity to serve as true participants in this educational environment.

The following lesson represents an introductory-level Internet activity in the **C.O.N.E.Y.** Project that allows you to obtain weather data in several New York City locations, analyze maps and graphs and to interpret the effect of the ocean-land interaction.

PROCEDURE:

- ☞ Students or the teacher will connect to the **C.O.N.E.Y. Project Home Page**, located at *URL* address ***http://maestro.com/~canarsie*** **(Canarsie High School Science Home Page)**.

- ☞ Ideally, each student should have access to a computer terminal. However, this project can be conducted in the classroom using a computer/TV connection or a computer/overhead or LCD panel connection. The teacher should make copies of the project to be distributed to each student.

- ☞ Once the **C.O.N.E.Y. Home Page** has been loaded, students should use the on-line images to answer the questions at the end of each section.

1. *Image # 1* is an image of *New York City* taken from the Space Shuttle. The map is a satellite depiction of the New York City area. On this map, *North* is located at the top of the map. Answer the 2 questions that follow the map.

× a) _____

_____

× b) _____

_____

2. *Image # 2* is a graph of the *average high temperature* at Central Park *(blue)* and JFK *(red)*, for the month of April, 1996. Answer the 2 questions below the graph.

× a) _____

_____

× b) _____

_____

3. *Image # 3* is a graph of the *average wind speed* at Central Park *(blue)* and JFK *(red)*, for the month of April, 1996. Answer the 2 questions below the graph.

× a) _____

_____

× b) _____

_____

4. *Image # 4* is an image of the borough of *Brooklyn*. The weather stations in this project are indicated by blackened in circles. Answer the 2 questions below the graph.

× a) _____

_____

× b) _____

_____

5. *Image # 5* represents the daily maximum and daily minimum temperatures of New York State on a typical date in April. Analyze the data in the map image. In a brief essay, answer the following:

- ☞ describe the area reflecting the warmest and of the coolest daytime temperatures in the region

- ☞ describe the area that is identified as displaying the most varied temperatures during the nighttime hours.

- ☞ describe the presence of how the ocean influences the distribution of temperatures across New York State on this day.

TOPIC: METEOROLOGY
HOW CAN WE PLOT THE MOVEMENT OF A HURRICANE USING LATITUDE AND LONGITUDE?

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TEACHER REFERENCE SHEET

INSTRUCTIONAL OBJECTIVES:
Students will be able to ...
- define *latitude, longitude, hurricane, and tropical storm*
- analyze past and present locations of hurricanes and tropical storms and plot predicted movement
- construct a plotted map of the storms past and future movement
- predict the future movement of the hurricane

MATERIALS AND SET-UP:
This lab activity is designed for classroom use or in lieu of a standard latitude/longitude mapping exercise. If a computer room is available for individual student use, the teacher should make provisions for each computer station to be able to access the necessary files.

1) Access the Canarsie High School Home Page (***http://maestro.com/~canarsie***), find the title of the laboratory activity and click on the corresponding link site for weather maps. This activity will make use of downloaded **.gif* image files from The National Hurricane Service.

2) The first map you will need to download is a latitude/longitude map of the East Coast of the United States. This map can be found on the *Tropical Weather Section* link site of the Canarsie High School Home Page.

3) If a hurricane is currently in the Atlantic Ocean, then it is highly recommended that teachers use this data to plot the tracking map.

4) If a hurricane is NOT presently found in the Atlantic, then it is expected that teachers will use the data that comes with the lab activity.

5) Due to the timing of hurricanes, it is expected that teachers use this lab activity during the months of September/October, during the teaching of latitude/longitude (Unit 1).

6) These files may also be stored and accessed through a compatible-format viewer or the Paintbrush Accessories program in Windows. The images should be converted to **.bmp* file format.

7) You must then retrieve the latitude/longitude data to plot. If you are using a current storm, access the following address: (***http://cirrus.sprl.umich.edu/wxnet/tropical.html***) and get the latitude pairs for the current storm. If you are using the sample data, it is provided with the lab.

8) Obtain the official hurricane forecast positions from the National Hurricane Center. If you are using a current storm, go to (***http://cirrus.sprl.umich.edu/wxnet/tropical.html***) and download the current marine advisory for the storm. If you are using the sample data, it is provided with this lab.

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Name _____ Date _____

PRE-LAB WORKSHEET

Aim: How Can We Plot the Movement of a Hurricane Using Latitude and Longitude?

Directions: Soon, you will be carrying on this activity using technology in the Earth Science Laboratory. In order to make your laboratory work more meaningful and enjoyable, you are asked to define the following terms and answer the following questions. Use your textbook and class notes to help you. The index of your book can be very useful.

1) Define:

a) latitude - _____
_____

b) longitude - _____
_____

c) hurricane - _____
_____

d) tropical storm - _____
_____

2) Using the *Earth Science Reference Tables*, find the latitude and longitude of the following places in New York State.

a) Binghamton latitude: _____ longitude: _____

b) Utica latitude: _____ longitude: _____

c) Albany latitude: _____ longitude: _____

d) Buffalo latitude: _____ longitude: _____

e) Mt. Marcy latitude: _____ longitude: _____

TOPIC: METEOROLOGY
HOW CAN WE PLOT THE MOVEMENT OF A HURRICANE USING LATITUDE AND LONGITUDE?

Name _____ Date _____
Teacher _____

HOW CAN WE PLOT THE MOVEMENT OF A HURRICANE USING LATITUDE AND LONGITUDE?

INTRODUCTION:

Hurricanes are probably the most powerful weather event that can affect the environment. Since the times of Columbus, hurricanes have terrified and amazed us with their power, fickleness and even grace. Today, the job of forecasting hurricane movement is that of the National Hurricane Center. They use the latest in technology to plot where a hurricane is presently located, and where it will be in 24 to 48 hours. One of the basic tools that a meteorologist must master is the use of latitude and longitude.

STUDENT OBJECTIVES:

You will be able to ...

- define *latitude, longitude, hurricane, and tropical storm*
- analyze past and present locations of hurricanes and tropical storms and plot predicted movement
- construct a plotted map of the storms past and future movement
- predict the future movement of the hurricane

MATERIALS & RESOURCES:

PC computer w/ Windows and TV/video monitor
peripheral PC/TV converter box
modem line (optional)
**.bmp* image of hurricane plotting map
black-line master of map

PROCEDURE:

TASK # 1 - Plotting Past Hurricane &Tropical Storm Positions

1) Using Paintbrush in Windows Accessories, open file (*hurrchrt.bmp*). Use the mouse to draw points for every position on your plotting table. For each point on your map, write down the time and date that you find on your table. Connect the points to form a line.

TASK #2 - Predicting Future Hurricane Positions

1) Using the forecast positions for the hurricane provided by the National Hurricane Center, plot the predicted path of the storm for the next 72 hours using a different colored pen or pencil.

2) Connect all the points on one line and answer the following questions.

TOPIC: METEOROLOGY

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ANALYSIS:

Answer these questions based upon your completed hurricane plotting chart, your Earth Science Reference Tables and your knowledge of Earth Science.

1) Why are latitude and longitude important in the plotting of hurricanes and tropical storms?

×_____

_____

_____

_____

2) Describe the general direction of the hurricane movement in the early part of your chart, what about at the end?

×_____

_____

_____

_____

3) Using the scale on the map, determine how close the hurricane gets to New York City.

×_____

_____

_____

_____

4) Determine the distance that the hurricane is from each of the cities below. Use the hurricane closest approach to each city as your guide.

Miami:	_____	Cape Hatteras:	_____
Savannah:	_____	Philadelphia:	_____

FOLLOW-UP ACTIVITY:

☞ If the storm that you plotted is one that is actually happening at this time, watch the local news or Weather Channel to see if the storm follows the predicted path given by the National Hurricane Center. Describe hurricanes that have affected New York City in the past and discuss the possibility of future hurricanes.

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SAMPLE DATA FOR LAB

DATA FOR HURRICANE FELIX 1995

DATE	**TIME**	**LATITUDE (☛N)**	**LONGITUDE (☛W)**
8/11/95	*12:00*	20.9	-56.2
8/12/95	*00:00*	22.5	-58.6
8/12/95	*12:00*	24.0	-61.0
8/13/95	*00:00*	25.5	-62.1
8/13/95	*12:00*	27.4	-62.4
8/14/95	*00:00*	28.2	-62.4
8/14/95	*12:00*	30.5	-63.7
8/15/95	*00:00*	31.2	-65.3
8/15/95	*12:00*	32.4	-67.5
8/16/95	*00:00*	33.8	-70.9
8/16/95	*12:00*	34.6	-72.5

* *

FORECAST DATA FROM THE NATIONAL HURRICANE CENTER

	LATITUDE (☛N)	**LONGITUDE (☛W)**
12 HOURS		
08/17/95 (00:00)	**35.3**	**-73.1**
24 HOURS		
08/17/95 (12:00)	**35.9**	**-73.0**
36 HOURS		
08/18/95 (00:00)	**37.0**	**-71.4**
48 HOURS		
08/18/95 (12:00)	**37.2**	**-69.6**

Note: The time 00:00 refers to midnight GMT. This is about 7:00 pm New York time. The negative sign in front of the longitude is just a shorthand way of signifying that it is degrees west.